PROGRESS REPORTS

FROM

EXPERIMENT STATIONS

SEASON 1957-58

NORTHERN NIGERIA

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SAMARU, ZARIA PROVINCE

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GOMBE, BAUCHI PROVINCE

Seed Multiplication	...	A. M. KRZYWON, M.A.

NORTHERN NIGERIA

PROGRESS REPORT FOR THE SEASON 1957-58

Planting period: June to September.
Picking period: November to March.
Close season: April to June.

General Introduction.

BY

H. E. KING, M. A. CHOYCE and D. A. LAWES

Season and General.

The season was extremely good. Weather during the early part of the year 1957 was such that food crops were planted in good time and in consequence a greater proportion than usual of the cotton crop was also timely planted. Weather subsequent to planting was in general very favourable and in almost all areas considerably higher yields than usual resulted. The commercial crop for export reached a new high record both in terms of total lint (240,000 bales of 400 lb.) and in terms of production per ton of planting seed (approximately 15 bales per ton of seed issued).

In the absence of any reliable data on which average yield per acre can be calculated, this latter figure must serve as the best available indication of the success of the crop: the previous highest was 12½ bales per ton in season 1954-55.

Yields at Samaru and other government stations reflected the good season and were well above average. In the seed multiplication areas of Southern Katsina and Gombe Division, growing 26J, production was particularly high and the crop was exceptionally early, arriving in a flush which disorganised the markets.

The monthly figures for meteorological readings at Samaru, with past averages, are given in Table 1. The total rainfall, 54·91 inches, was the third highest recorded during 34 years, but the distribution was such that surface flooding, often serious during much of July, August and September when rains are heavy, was absent except for short periods. Moreover, in spite of the high rainfall, sunshine for the period mid July to mid August was not deficient compared with normal seasons, but averaged two hours per day above the mean for the previous three years.

TABLE 1.

SUMMARY OF METEOROLOGICAL DATA AT SAMARU UP TO 1957.

Month	*Rainfall*		*Days rain*		*Relative humidity*				*Air temperature °F (screen)*				*Sunshine daily mean (hours) (1)*		*Open pan evaporation (inches) (2)*	
	1957	1924 -57	1957	1928 -57	1957 *10 a.m.*	1957 *4 p.m.*	1954 -57 *10 a.m. av.*	1954 -57 *4 p.m. av.*	1957 *Max.*	1957 *Min.*	1938 -57 *Max.*	1938 -57 *Min.*	1957	1954 -57	1957	1954 -57
January	0·00	0·00	—	—	20·4	13·8	19·2	15·1	85·5	54·8	88·4	57·5	9·7	9·4	6·39	6·89
February	0·00	0·06	—	—	11·3	8·6	20·1	13·4	87·3	58·4	91·6	60·6	10·0	9·6	8·93	7·67
March	0·00	0·40	—	1	20·2	12·0	34·3	19·8	94·9	65·8	96·1	67·2	8·8	8·6	9·53	8·60
April	2·04	1·28	5	3	54·1	26·7	54·9	31·5	95·7	71·5	97·2	71·1	7·8	7·8	7·30	7·17
May	10·49	5·40	15	11	70·7	55·1	66·0	46·6	89·4	69·5	91·7	70·1	7·6	8·3	5·12	6·76
June	5·98	6·30	15	13	79·0	63·4	76·9	62·4	85·8	67·6	87·9	68·1	7·6	8·0	4·93	5·44
July	10·04	8·90	15	16	80·3	66·5	80·2	67·5	83·5	67·1	83·5	67·3	7·3	6·0	4·72	4·81
August	12·40	11·79	20	21	82·9	64·8	84·0	70·6	83·5	67·2	81·9	66·9	6·3	4·6	4·94	4·45
September	10·37	8·85	19	17	77·2	63·9	77·5	64·5	84·5	66·6	84·9	66·7	6·5	6·5	4·63	4·93
October	3·59	1·52	8	4	71·5	54·4	63·3	48·2	87·3	66·4	89·0	65·4	8·5	8·6	5·13	5·64
November	0·00	0·05	—	—	48·8	26·6	33·9	23·1	90·8	62·3	90·1	60·7	9·4	10·0	4·87	6·20
December	0·00	0·00	—	—	28·0	22·2	25·6	20·5	87·7	58·4	87·9	57·8	9·8	9·8	6·64	6·65
Totals	54·91	44·55	97	86	—	—	—	—	—	—	—	—	—	—	73·13	75·21
Mean	—	—	—	—	53·7	39·8	53·0	40·3	88·0	64·6	89·2	65·0	8·3	8·1	6·09	6·27

(1) Campbell-Stokes sunshine recorder.

(2) From sunken tank 6′ × 6′. not corrected for errors due to splash.

Presumably as a consequence of this combination of circumstances, the growth of the cotton plants was unusually advanced by the end of August and the setting of bolls during early September was exceptionally good. As a result of this, picking commenced early with a heavy flush in late November and high yields were reached in most experiments before the end of December. Details of some exceptionally good yields are given in the body of this report.

The early development of the crop was advantageous to cotton stainers (*Dysdercus* sp.) while the weather which favoured the good early growth of the crop was favourable also to the development of bacterial blight (*Xanthomonas malvacearum*). Damage by both was above average at Samaru and at other stations at which observations were made. Stainers were particularly troublesome at Daudawa and probably reduced yields appreciably. A fuller summary of the insect pest incidence appears in a later section of this report.

Staff, Buildings and Land.

H. M. Parker, who joined the staff here in January 1956, and carried out two seasons of most valuable work on bacterial blight, died suddenly of poliomyelitis on 11th February 1958.

Mr. Lawes returned from leave on 18th July 1957. Mr. Krzywon took leave from 16th May to 4th October 1957. Mr. Choyce proceeded on leave on 3rd March 1958.

Mr. Manning visited Samaru from 25th July to 19th August 1957, to advise on climatological and crop physiological work. Together with Mr. Farbrother and Mr. Arnold he paid a further visit in November to attend the Cotton Conference.

The acute shortage of junior staff of suitable calibre for the field and laboratory recording work was partially relieved at the end of the season by the welcome return of two men from training courses.

West African Inter-territorial Conference.

A conference arranged under the auspices of the British and French Governments of West African Territories with the Ministry of Agriculture, Northern Nigeria as hosts, was held at Samaru from 18th to 23rd November 1957. Officers of the Corporation took part in the preparations, presented papers and gave demonstrations in the field and laboratory of the work going on at Samaru. The papers presented are listed at the end of this report.

A total of some 31 delegates from British, French, Belgian and Portuguese Territories attended together with one representative from Ghana.

Cotton Breeding

BY

H. E. KING, D. A. LAWES and B. J. S. LEE.

Reselection and Hybridization.

The established programme of straight reselection work within Allen material (Samaru 26C, 26J and other derivatives of Nigerian Allen Long Staple) was continued. In all, 160 progenies of this origin were tested in three large replicated experiments.

In addition a dozen progenies derived from selections within imported types (BP52 and Albar material from Uganda) were compared in a separate replicated test.

The overall results were in general highly satisfactory. Wide differences occurred between progenies and a considerable number which combined high yield with good ginning percentage and adequate lint length could be picked out for carrying forward to small bulk tests.

The isolation of progenies differing clearly amongst themselves, with some showing very marked advance on the parent type, suggests that the methods of selection in recent seasons have been efficient and indicates that the material contains ample variability which can be exploited still further if work can continue on an adequate scale and with the necessary precision.

Analyses of the data for components of yield showed that the progenies within even closely related groups of material differed significantly in bolls per plant, seeds per boll and lint per seed, as well as in yield of lint. It is clear also that this Allen material could respond to selection for increased lint length if this proved desirable. An increase up to the limit beyond which saw ginning would be inappropriate should prove quite possible without loss of yield.

The study of genetic differences in tendency to regrowth of cut stumps at end of season was continued. This work has been briefly reported elsewhere*.

The progenies of imported material referred to earlier gave nothing of convincing all-round promise. All suffered, in comparison with 26J, from low ginning percentage and their advantages in other characters did not appear sufficient to counterbalance this.

The resistance to bacterial blight which Albar material shows in East Africa has not proved itself of value at Samaru in terms of increased yield: there appears to be nothing to be gained by selecting within it here until a technique has been developed for assessing resistance under local conditions.

*King, H. E. and Lee, B. J. S. "Genetic differences in vitality of cotton plants cut back at the end of a season (with addendum)". Empire Cotton Growing Review, XXXV, 3, July 1958.

Hybridization work, including the panmixis programme and investigations into the extent of natural outcrossing in cotton fields, has continued.

Tests of Small Bulks and Strains.

Material beyond the progeny row stage was tested in replicated experiments in which yield, ginning percentage, lint length, seed weight and lint index, as well as growth and appearance in the field, could be closely compared. As a result it was possible to pick out several new substrains for advancement to the series of district variety tests. Amongst the field characters closely observed at this stage was jassid resistance. It appears necessary to watch this closely in all reselection work on 26J material as the overall standard is barely good enough and even a slight falling off in a reselection is dangerous.

As noted earlier, in discussing the breeding work, differences in lint length are readily found in reselections of this stock. There is a distinct tendency for high lint yield and high ginning percentage to be associated with shorter lint but current work promises to overcome this. The strains chosen for further trial appeared to combine high yield with lint fully up to 26J standard.

District Variety Tests.

The usual series of district variety tests sited at 11 stations throughout the cotton belt was carried through. The produce from these tests, totalling some 700 separate bags of seed cotton, is all ginned at Samaru to provide ginning percentage data, seed weights and lint samples.

The work involved in this is very considerable, as also is the work involved at the stations which plant and harvest the experiments, and it is satisfactory to be able to record that this season's results were highly rewarding to all concerned. The control type used throughout all the tests was the proved high yielding second wave 26J. Every one of the other seven strains included in the tests exceeded this control in both seed cotton and lint yield on average over the series. These results are summarised in Tables 2 and 3.

Two strains each gave an increase of over 23% in lint yield. Of these, strain 7 (see Table 3), was included as a known high yielder but of inadequate lint length. It had been thought worth inclusion in district trials by reason of its yield alone but will receive no further attention at present, since its yield performance was almost equalled by a second strain of better lint length.

TABLE 2.

DISTRICT VARIETY TESTS. SEASON 1957-58.

Seed cotton yields from nine experiments.

Experiment	*Yield of control in lb. per acre*	*Yield of the other seven strains in the tests expressed as percentage of that of control strain.*							*S.E. %*
		2	3	4	5	6	7	8	
Samaru Timely	749	101	104	102	103	96	114	93	2·6
Samaru Delayed	521	104	123	103	107	106	119	106	3·3
Daudawa	342	100	137	99	109	103	119	99	7·7
Anchau	438	100	114	101	96	108	99	88	6·8
Gombe	546	115	123	104	105	102	107	111	5·4
Gusau	706	95	109	99	102	94	106	109	4·3
Hadejia	383	118	120	124	108	105	110	111	6·4
Maiduguri	504	114	113	111	104	104	103	103	5·3
Kontagora	203	97	115	94	92	91	133	93	5·8

For details of strains see Table 3.

Results of experiments at Zonkwa (S.E. 13·2%), Birnin Kudu (S.E. 10·5%) and Misau (very irregular and not worth statistical analysis) are omitted.

TABLE 3.

DISTRICT VARIETY TESTS. SEASON 1957-58.

Combined results from nine experiments.

Strain	*SC yield as % of control*	*Gin %*	*Lint yield as % of control*	*Lint length (Bailey halo mm.)*
Strain 1 = Control Second wave 26J	100	34·65	100	33·9
Strain 2 New blend of 26J substrains	104·9	35·19	106·5	34·7
Strain 3 479-25BCP/14	117·5	36·36	123·3	33·2
Strain 4 479-25-44/27	103·9	35·32	105·9	35·2
Strain 5 479-25-44/31	102·9	35·09	104·2	34·5
Strain 6 479-25-44/39	101·1	36·01	105·1	34·5
Strain 7 499-5DBCP-91-2	112·2	38·52	124·7	31·5
Strain 8 4940BCP-82-1-5	101·4	36·19	105·9	33·1

This latter, strain 3 of Table 3, is a 26J derivative and is now undergoing spinning tests in Lancashire. It is unlikely to prove quite equal to 26J itself in quality but is clearly worth further consideration.

The blend of 26J substrains already chosen to go forward to the seed multiplication scheme as third wave 26J gave a lint yield averaging 6·5% higher than second wave 26J. This higher yield was accompanied by a slight further improvement in average halo length on combed seeds.

Seed Multiplication.

The numerous small seed multiplication plots which must be grown each season to maintain stocks of strains under trial all gave good

yields. Many of these plots were used for trying out combinations of agronomic treatments aimed at enhancing yields: the results of some of this work are referred to later.

Larger scale seed multiplication at Daudawa and the bulk multiplication schemes in Southern Katsina and Gombe Division of Bauchi Province all gave extremely good yields. As a result the seed stocks of 26J, which at the commencement of the season represented 2·8% of the total seed requirements of the country, were built up to over 14%.

Of the total commercial crop in the 1958-59 season, the proportion produced from this seed is likely to be about 22%, since it has been used for planting areas of above average productivity. This should enable at least 60% of the 1959-60 crop to be planted with 26J seed.

Crop Physiology and Agronomic Experiments

BY

H. E. KING, D. A. LAWES AND B. J. S. LEE.

The work on the relationships between rainfall, soil moisture and crop growth, referred to in last season's report and also in a note published separately*, was continued. No additional staff has been available for this work and it has perforce been fitted in with, and to some extent in place of, the cotton breeding work.

The current season's results have not yet been fully worked out but, in some respects at least, they fail to agree with some of the 1956-57 results. It is hoped to study these further in the light of a third season's results before presenting the full outcome of this work.

Briefly, groundnut shell mulching was successful, as in 1956-57, in increasing yields but other mulches (dead grass and crushed guineacorn stalks) failed when applied to cotton. Cross tying of ridges did not give the increase in yield observed in 1956-57 but appeared to depress yields somewhat.

A mass of soil moisture determinations, electrical resistance measurements (by nylon units), leaf areas and turgidities and fruiting point counts await detailed consideration. From preliminary study it appears that treatments which result in holding additional water on the land during the height of the rains may in some seasons have harmful effects too great to be cancelled out and replaced by a gain derived from additional moisture available after the rains have ceased.

It is highly probable that the response to water conservation measures is dependent on other factors such as fertility level and it is

*Lawes, D. A. "Preliminary report on soil-water-crop relationships at Samaru." Empire Cotton Growing Review, XXXIV, 3, July 1957.

beyond doubt that responses to early planting and to heavy fertiliser applications are limited by insect pest infestation. Pending the disentanglement of the different but interlocked factors by complex multifactorial experimentation the attempt was made this season to achieve a successful combination of all the main factors at empirically chosen favourable levels.

A half-acre plot of land, already in good heart, was heavily dressed with farmyard manure and night soil compost, cultivated and ridged well in advance of the planting date and cross tied. It was planted with 26J on 25th June, using acid treated Agrosan dressed seed, and fertilised with superphosphate and sulphate of ammonia by placement.

A further dressing of nitrogen (urea) was given in August. Three applications of a DDT/BHC spray were made to protect from stainer damage and a surface mulch of grass was applied after a final hoeing in September.

The result was a yield of just over 1,900 lb. of seed cotton per acre. It is not possible to distinguish the separate contributions of the various treatments but it can be argued that the early planting of a high yielding strain on land in a high state of fertility generated a high yield potential and that subsequent measures to conserve moisture and protect against insects enabled this yield to be realised.

The strong leafy growth verging on rankness would, in the absence of insecticidal treatments, have given very favourable conditions for severe damage by insect pests, particularly stainers.

A very small scale experiment on supplementary watering gave results of considerable interest. Water was added to plots of cotton subsequent to the end of the rains, the quantities and intervals being based on estimates of requirements determined from (a) Garnier's calculations*, (b) tensiometer readings. In all, quantities approximating to 10 inches of rain were added over the period October-December in variable doses at approximately 5 day intervals.

Plots which had been planted in early July showed no increase in yield over unwatered controls. Cotton planted twelve days later, however, which gave a 25% reduction on the earlier planting when not watered, gave a marked response to added water which increased the yield to the level of the early July plantings.

This result is in keeping with the view expressed elsewhere** that early planted cotton in N. Nigeria does not benefit from late continued rains. Larger scale experiments are of course required to confirm that this is so and to investigate the extent to which higher fertility levels, different cultural treatments or change of strain might alter this situation.

*Garnier, B. J. "Using potential evapotranspiration as a guide to the water requirements of crops." Unpublished note, 1957.

**King, H. E. "Cotton yields and weather in N. Nigeria." Empire Cotton Growing Review, XXXIV, 3, July 1957.

Formal replicated planting date experiments on a much larger scale at Samaru and Daudawa gave the familiar results—good yields from mid June and early July planting, a substantial drop with planting delayed till mid July and a further very substantial drop when planting was delayed until the end of July.

The persistence with which the cotton farmer clings to August and even September planting in the face of all such results is a most disheartening feature of the N. Nigerian cotton growing industry.

The mean figures for six recent experiments which covered two widely different fertility levels at each of two localities over three seasons are given in Table 4.

TABLE 4.

YIELDS OF SEED COTTON IN LB. PER ACRE FROM PLANTING DATE EXPERIMENTS AT SAMARU AND DAUDAWA OVER THREE SEASONS.

Planting date	*High fertility*		*Low fertility*		*Overall mean*
	Samaru	*Daudawa*	*Samaru*	*Daudawa*	
19th June	669	579	416	422	522 (108%)
3rd July	648	516	330	436	483 (100%)
17th July	486	364	236	331	354 (73%)
31st July	365	320	182	259	282 (58%)

Miscellaneous.

The study has been continued at Samaru of small samples of seed cotton from a range of cotton markets chosen as representative of the cotton growing areas. The tentative finding mentioned in the 1955-56 report—that there are appreciable locality effects—has been confirmed. Even within a single ginnery area quite wide differences between one market and another in average lint length are found to occur and to be repeated in successive seasons.

The practice of delinting seed (by passing it through a linter gin) has been continued at Samaru as an aid to economy of seed in the early stages of seed multiplication. Replicated experiments comparing the yield of a crop grown from delinted seed with that from "raw" seed have now been carried out for three seasons at Samaru and Daudawa. The average yields from the six experiments are as follows:

Raw seed	398 lb. per acre	(100%)
Machine delinted seed	413 lb. per acre	(103·7%)
S.E.	3·5 lb. per acre	(0·88%)

These figures show how even a small effect may be established with precision if the scale of experimentation is large enough. Each individual experiment contained 24 plots of each treatment so that the total number of comparisons was 144. (The experiments were not, of course, devoted to this comparison alone but were multifactor ones).

An increase of 3·7% over a 200,000 bale crop would be worth something like £300,000. Delinting decreases the weight of the planting seed by about 6-7% and the bulk (for transport) by as much as 33%.

Plant Pathology.

A great part of the programme of work on bacterial blight for the season was directed to confirming and adding further to knowledge of the action of cotton plant debris (both stored and weathered) in the presence and absence of mercuric seed dressing. The results of this work (which depended on field observations of seedlings and not on final yields of the plants) were included in a paper by H. M. Parker presented to the Cotton Conference at Samaru in November 1958, to be published separately.

The overall finding was a confirmation of the inference drawn last season that debris exposed to weathering is not a major source of infection of the crop at Samaru.

Further results of the season's work have not been fully worked out, but in general yield differences from the small plots did not reflect differences in infection noted during growth. The usual late spread of infection across plot boundaries took place and obliterated initial differences.

The season was one of far more than average incidence of bacterial blight; the disease appeared early and remained conspicuous for longer than usual. Observations suggested that the effect on yield must have been quite considerable and that the present level of resistance of 26J is far from adequate for such conditions.

Convincing confirmation of this was obtained from a field experiment carried out at Shika* where eight acres of land were made available for this work by courtesy of the officer in charge there.

With the unusually large area available, a plot size of 1/6th acre was possible both for the individual cotton plots and for the intervening screens, which were planted with sunflower. Under these conditions spread of infection from plots planted with undisinfected seed was substantially checked; the initial striking difference between these plots and those planted with disinfected seed was maintained far longer than in smaller experiments.

The final yields of seed cotton in lb. per acre (average for 13 replications) were:—

Undressed seed	342
Seed dressed with Agrosan 5W @ 1:150	431
Increase attributable to dressing	89 ± 12·4

*Ministry of Agriculture stock farm 5 miles from Samaru.

This increase (26% ± 3·6%) gives striking evidence in favour of seed dressing in a season such as this. Only 2 or 3 pounds need be deducted from the gain of 89 pounds of seed cotton to cover the cost of the dressing. Even supposing a response of this magnitude is obtained only in exceptional seasons routine annual dressing would appear certain to prove highly profitable over a period of years.

Entomology

BY

M. A. CHOYCE.

General Pest Situation.

At Samaru the season was remarkable for the very favourable growing conditions during July and August, resulting in the early development of well grown plants from timely sown cotton. Numerous bolls were set during September, and the crop proved more than usually attractive to the cotton stainer *Dysdercus superstitiosus* F.; this insect moved into the better cotton fields in considerable numbers during late September and early October. Up to 30% of the early set bolls showed typical stainer lesions internally during this period, and a high proportion of the lower crop failed to open normally.

On poorer cotton, the population of adult stainers did not become large until November, when 5,000-6,000 per acre were noted on some fields.

Bollworms became most common in November; compared with last season, fewer red bollworms, but more pink and spiny bollworms were recorded on the observation plots. Appreciable numbers of aborted and shrivelled bolls became apparent during November, but in many cases it was impossible to allocate the cause with any certainty to bollworms, bacterial blight, or the onset of the dry season.

The cotton leaf roller, *Sylepta derogata,* was abnormally common from August onwards. The yield from 150 badly infested plants was found to be 35% lower than the yield from 150 similar plants not so infested. As the proportion of plants affected seldom exceeds a few per cent., this insect can be regarded as only a minor pest.

On the observation plots at Samaru, the cotton was moderately good, and peak flowering occurred during the second week of October. There followed a rapid fall in the daily rate of flower production to the end of the month. Subsequently there was a flush of ripe bolls during late November and early December, with only small pickings

to follow. On the whole it appeared that the favourable early growing conditions compensated to a large extent for the damage done by pests.

On the seed multiplication farm at Daudawa, where some of the cotton was sown as early as 19th June, the situation was similar to that at Samaru, except that pest damage was generally more severe. Only 10 to 15 per cent. of early set bolls were completely free from bollrots caused by stainers. In an attempt to minimize the effect of these insects 82 acres of Stage C cotton were sprayed by hand using 2·3 lb. DDT plus 0·5 lb. gamma BHC per acre. This was most effective in killing stainers within the crop, but the spray was applied a little too late to be totally effective, and some lint staining and loss of seed viability occurred.

The results of an examination of samples of seed cotton from various markets are shown in Table 5; numbers of pink bollworms in commercial seed cotton were again at a low level.

Table 5.

Pink bollworms found in seed cotton samples from various cotton markets, 1957-58.

NA grade	*No. of samples*	*Larvae inside seed*		*Larvae outside seed*		*Totals*		
		Living	*Dead*	*Living*	*Dead*	*Living*	*Dead*	*Living and Dead*
I	72	26	74	10	38	36	112	148
II	75	41	90	16	25	57	115	172
III	71	77	174	12	31	89	205	294
Totals	218	144	338	38	94	182	432	614
Number of larvae per 10 lb. sample, 1957-58						8·3	19·8	28·2
Number of larvae per 10 lb. sample, 1956-57						8·6	7·7	16·3
Number of larvae per 10 lb. sample, 1955-56						7·1	18·4	25·4

Insecticide Trials.

The programme of insecticide trials laid down for this season was intended to obtain further information on the control of the cotton stainer, and most of the experiments were carried out at stations in the Riverain Provinces, where this pest is predominant.

(a) *Mokwa* (Niger Province).—Two complementary trials were laid down at this station; in one (Expt. No. X8(57), Mokwa, 1957) the number and dates of application of insecticide were varied, and the rate of application was kept constant for each treatment. In the other trial (Expt. No. X10(57), Mokwa, 1957) the rate of application of insecticide was varied, with the number and dates of application remaining constant for each treatment. Details concerning the two experiments are given in Tables 6 and 7.

TABLE 6.

EXPT. X8(57) MOKWA, 1957. OPTIMUM TIME AND NUMBER OF APPLICATIONS OF INSECTICIDE TO COTTON. SUMMARY OF TREATMENTS AND YIELDS.

Treatment	*Dates of application*									*No. of applications*	*Yield of seed cotton lb./acre*	*Yield as percent of control*	*Percent clean seed cotton*
	30/8	6/9	13/9	20/9	27/9	4/10	11/10	18/10	25/10				
A	*	*	*	*	*	*	*	*	*	9	986	211	75
B		*	*	*	*	*	*			6	981	210	70
C				*	*	*	*	*	*	6	853	182	66
D		*	*	*	*					4	836	179	66
E				*	*	*	*			4	827	177	74
F						*	*	*	*	4	661	141	67
G										0	468	100	45

NOTES: Layout: 4 blocks of 7 plots, fully randomised; each plot 15 yds. × 24 ridges.

Discards: 4 yds. or 4 ridges between plots.

Cotton sown 14th June on ridges 2½ ft. apart, spacing 2 ft.

Uniform application of 1 cwt. superphosphate and 1 cwt. sulphate of ammonia per acre, on 12th July.

1 lb. DDT plus 0·5 lb. BHC in 40 gallons of water per acre applied to each treatment on dates indicated.

TABLE 7.

EXPT. X10(57), MOKWA, 1957. OPTIMUM CONCENTRATION OF INSECTICIDE ON COTTON. SUMMARY OF TREATMENTS AND YIELDS.

Treatment	*Insecticide: rate per acre per application*	*Yield of seed cotton lb./acre*	*Yield as percent of control*	*Percent clean seed cotton*
A	0·3 lb. gamma BHC	648	128	59
B	0·5 lb. gamma BHC	674	133	58
C	0·3 lb. gamma BHC+1 lb. DDT	928	183	69
D	0·5 lb. gamma BHC+1 lb. DDT	916	180	69
E	0·5 lb. gamma BHC+2 lb. DDT	969	191	75
F	Nil	508	100	50

NOTES: Layout: 5 blocks of 6 plots, fully randomised; each plot 12 yds. × 15 ridges.

Discards: 3 yds. or 3 ridges between plots.

Cotton sown 14th June, 2 ft. spacing on 2½ ft. ridges.

Uniform application of 1 cwt. superphosphate and 1 cwt. sulphate of ammonia, on 13th July.

8 applications of insecticide made on each treatment at rates shown at weekly intervals from 5th September to 4th October.

In view of the results obtained last season, the times of application of insecticide were chosen to cover in varying degrees the primary invasion of stainers into the crop. This year small numbers of adults were seen on unsprayed cotton during the second week of September; the population increased rapidly in early October, decreasing by the

end of the month. A second generation was produced during November, but only a few third-generation stainers were noted owing to the early maturation of the crop.

In Expt. X8(57) good control of the immigrant stainers was achieved by treatments A, B, C and E, as shown by weekly counts of adults. With treatment D, stainers were recorded after 4 sprays had been applied; with treatment F, stainers were recorded before spraying began.

An analysis of locks in split bolls (Table 8) shows that damage by the stainer was not entirely eliminated. In an experiment of this type, with sprayed plots alongside unsprayed plots and discards, it is likely that movement of stainers between the various treatments takes place; as a result, it is probable that the yields of the sprayed plots are lower, and the yields of the unsprayed plots higher, than they would otherwise have been.

TABLE 8.

EXPT. X8(57), MOKWA, 1957. ANALYSIS OF DAMAGE TO LOCKS IN SPLIT BOLLS, EXPRESSED AS PERCENTAGE OF TOTAL LOCKS.

Treatment	*A*	*B*	*C*	*D*	*E*	*F*	*G*
Clean locks	66·2	57·8	41·4	45·8	46·3	42·5	25·3
Bollworm, partial	5·1	5·1	6·8	5·4	8·3	9·9	11·2
Bollworm, total	3·6	5·2	12·3	7·8	11·2	12·8	17·0
Non-bollworm, partial	20·6	27·9	32·3	32·0	29·5	28·8	33·4
Non-bollworm, total	4·4	4·0	7·2	9·0	4·7	6·0	13·0

NOTES: (a) Locks classified as "partial" indicate those which, although discoloured, would normally be picked by a farmer.
(b) Locks classified as "total" indicate those which would not normally be picked by a farmer, owing to excessive damage.

Although the treatments were chosen to determine the best method of controlling the cotton stainer, the figures given in Table 8 indicate that some control of bollworms was also achieved. The most common of these in the crop were the red bollworm, the pink bollworm and larvae of the false codling moth.

An examination of the yields from the various treatments in the two experiments shows that it would be reasonable to expect an economic yield of seed cotton if 6 weekly applications of 1 lb. DDT plus 0·3 lb. gamma BHC per acre were applied from early September to mid October. This will, therefore, be the main treatment to be used in a large scale trial covering 100 acres, to be laid down at Mokwa next season, to investigate the economics of insecticide application. The cost of insecticides and application should be about £7 10s. per acre; this charge would be covered by an increase in yield of 350 lb. of seed cotton.

The whole of this trial is to be sprayed using tractor-mounted equipment; to gain some idea of the difficulties involved a 6-acre field was sprayed four times by this method. Although the spray was not applied when the stainer population was at its highest, during the end of September and beginning of October, the field yielded 764 lb. seed cotton per acre (71% clean). A similar field of unsprayed cotton gave 229 lb. seed cotton per acre (30% clean).

(b) *Shendam* (*Lowlands Experimental Farm, Plateau Province*).—Stainers entered cotton sown in mid June, in mid August, and remained until December. Maximum numbers were reached during October, but there was no clear distinction between generations, as at Mokwa. Cotton receiving a series of four sprays (1·5 lb. DDT plus 0·5 lb. gamma BHC) at weekly intervals from 30th September, yielded 877 lb. seed cotton per acre. The yield of unsprayed plots, at 618 lb. per acre, was so high for this area that it is probable that the influence of the insecticide extended beyond the limits of the sprayed plots.

(c) *Gombe* (*Bauchi Province*) *and Kontagora* (*Niger Province*).—Similar trials were held at these stations: the effectiveness of three and six applications of dust (10% DDT, 3% BHC) at 10 lb. per acre during late September and October was compared. Yields from the dusted cotton were not high (Table 9). At Gombe stainers entered the crop two weeks before insecticide was applied. At Kontagora a heavy infestation of pink bollworm, and to a less extent, red bollworm, during November reduced the advantage gained by control of stainers early in the season.

TABLE 9.

YIELDS FROM INSECTICIDE TRIALS AT GOMBE AND KONTAGORA, 1957-58 (LB. SEED COTTON PER ACRE).

	Gombe	*Kontagora*
6 applications of cotton dust	478	302
3 applications of cotton dust	455	265
No insecticide	336	152

WEST AFRICAN COTTON CONFERENCE PAPERS.

Papers presented by members of E.C.G.C. staff at the West African Inter-territorial Cotton Conference at Samaru, N. Nigeria, November 1957.

"Cotton problems—a brief survey". H. E. King.

"Breeding systems used for cotton at Samaru". H. E. King and D. A. Lawes.

"Cotton seed multiplication in N. Nigeria". H. E. King.

"Genetic differences in vitality of cotton plants cut back at the end of a season". H. E. King and B. J. S. Lee.

"A note on the design and analysis of replicated progeny row tests". H. E. King.

"Crop loss by insect pests in Uganda". T. H. Coaker (presented by H. L. Manning).

"Insecticide trials in N. Nigeria". M. A. Choyce.

"Resistance to bacterial blight (*Xanthomonas malvacearum*) in Lake Province local cotton". M. H. Arnold.

"Survival of bacterial blight of cotton (*Xanthomonas malvacearum* (Sm.) Dowson) in crop debris". H. M. Parker.

"Water relations of cotton at Samaru". H. L. Manning.

"Rainfall and percolation studies at Samaru". D. A. Lawes.

"A rapid method of estimating leaf area in cotton". H. E. King and D. A. Lawes.

Appendix.

Origin and Main Characteristics of Cotton Strains Mentioned in this Report.

Allen or Nigerian Allen	Allen Long Staple, together with a number of contemporaneous strains of American Upland origin, was introduced into N. Nigeria in 1912 from East Africa. The present "Allen" is the result of growing the produce of this introduction successively for some 46 generations, exposed to admixture with other strains under trial and with the locally grown *Gossypium hirsutum* var. *punctatum*. Its present staple length is a bare 1″ on universal standards.
Samaru 26C	A selection from Allen originating from work commenced in 1931 and emerging as a recognised improved strain in 1939. Notable for its higher yield, higher ginning percentage and relative freedom from "nep". 26C/47 etc. refer to single plant selections made in 1947.
26J	A derivative of 26C obtained by straight reselection commenced in 1947, being material from the line 26C/479-25. Higher yielding and earlier cropping than 26C, with higher spinning quality.
26I/25	26I was a sister strain of 26C dating back to 1938; 26I/25 is a recent derivative.

Imported Types (obtained for trial or use in breeding work).

Uganda BP52	A high quality strain from Uganda.
Albar	Blackarm resistant selections from Allen, made in Uganda.

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PROGRESS REPORTS FROM EXPERIMENT STATIONS

The reports for the seasons up to and including 1950-51 were published in seasonal volumes; the following are still in print and available at 3/- per volume post free.

1923-25 (one volume), 1926-1927, 1931-32, 1934-35,
1935-36, 1942-43 and 1945-46 to 1950-51.

From 1951-52 the reports from each territory were published individually each season. A few of the 1951-52 reports are out of print, but all others are available post free at 1/- per report or 7/6d for the seasonal set.